

## Discrete anodes for impressed current cathodic protection of reinforcement steel in concrete structures

### Uses

Ebonex is a discrete Impressed Current Cathodic Protection (ICCP) anode, specifically designed to protect steel elements in concrete and some steel framed structures from corrosion. The anode utilises an innovative ceramic/titanium composite combined with an integral gas venting system. The system includes Ebofix grout, which is a high density, acid buffering grout used for long-term performance.

Ebonex anodes are available in a range of sizes, which provide excellent design flexibility. Ebonex discrete anodes are able to provide sufficient performance to satisfy the 100mV potential shift requirement for Cathodic Protection as specified under National Association of Corrosion Engineers (NACE) RP0290 & the European Standard EN12696 - Cathodic Protection of Steel in Concrete.

### Typical Applications

- Bridges
- Steel framed buildings
- Car parks
- Reinforced concrete in marine conditions

### Advantages

- Gas venting - no build-up of anodic gases and therefore can be installed under strengthening systems, membranes and coatings
- Discrete installation - no added dead weight loading or increase to physical dimensions of structure
- Long lasting - longest life expectancy of any discrete CP anode - in excess of 40 years, depending upon design
- Highest level of protection - satisfies the 100mV criteria for effective cathodic protection
- Proven technology - field verified performance
- Cost competitive compared with other types of CP installations
- Deep installation - addresses multi-levels of steel in difficult access areas
- High operating current - suitable for use in areas of high steel density
- Versatile - can be used in new construction as a preventative measure
- Flexible - available in a wide number of sizes to provide maximum design flexibility



### How Does it Work?

Ebonex works by distributing sufficient electrical current to overcome on-going corrosion in the structure. The Ebonex anodes are connected to an external DC power supply, which provides the electrical current that mitigates corrosion activity. According to industrial standards, an ICCP system is considered effective when the steel is sufficiently polarised to result in a 100mV depolarisation once the system has been turned off.

### Description

Ebonex is a discrete Cathodic Protection anode system providing long-term durability to both new and existing structures under highly aggressive conditions. In line with other cathodic protection systems, Ebonex discrete anode systems must be designed by corrosion specialists and installed by approved contractors.

Level of Protection	Description	Ebonex
Cathodic Prevention	Preventing new corrosion activity from initiating	✓
Corrosion Control	Significantly reduce ongoing corrosion activity	✓
Cathodic Protection	Highest level of protection intended to stop ongoing corrosion	✓

### Standards Compliance

Ebonex discrete anodes satisfy the 100 mV potential shift requirement for effective cathodic protection as specified under NACE (National Association of Corrosion Engineers) Standard RP 0290-90.

The design of Ebonex discrete anodes follows comprehensive criteria established for the patented 'Ebonex' (TM) system, described in patent no. PTC/GB99/00359, developed by Atraverda Ltd.

## Specification

Where indicated, cathodic protection to reinforced concrete elements shall be provided by Ebonex discrete composite anodes capable of maintaining long term stability at current densities of up to 900 mA/m<sup>2</sup> (of anode surface).

The Ebonex discrete anodes shall be gas vented and are fixed in place using Ebofix grout, a thixotropic high density, electrochemically compatible grout.

All design, fixing and installation shall be carried out by specialists experienced in the field of cathodic protection, approved by the anode system supplier.

## Instructions For Use

### Preparation

Ebonex discrete anodes are installed in pre-drilled holes 4 - 8 mm larger than the nominal Ebonex discrete anode diameter and typically no further than 600 mm apart (unless otherwise approved by the Engineer). The holes and Ebonex discrete anodes should be located to minimise their proximity to the steel reinforcement in order to provide an even current distribution to the steel within the local vicinity.

Cut a chase with a minimum depth of 20 mm and a width of 8 mm into the concrete between the holes. This chase is used to accommodate the titanium feeder wire, interconnecting the Ebonex anodes, and any gas discharge piping. A 3 mm saw cut can be used if the venting pipes are not interconnected.

Prior to application the holes and chases should be blown or vacuum cleaned of all debris and pre-soaked with water.

### Mixing

Ebofix grout should be mixed with a slow speed drill (400/500rpm) and Renderoc paddle. Place between 3.0 - 4.0 litres of drinking water, depending on required consistency, into a suitable mixing container and add one full 10 kg bag of Ebofix grout and mix for three minutes until fully homogeneous.

## Installation

Remaining water should be removed from the hole and the Ebofix grout injected by hand pump to the rear of the hole to avoid air entrapment, ensuring sufficient is placed to cover the entire length of the active Ebonex discrete anode. The thixotropic nature of Ebofix grout will prevent significant flow from vertical and overhead holes. Wet each Ebonex anode with clean water, but do not immerse for more than 10 seconds, before gently inserting into the hole. Ensure the vent pipe is unobstructed and that sufficient tail wire remains exposed to enable connection with the feeder wire.

Place the Ebofix grout within 30 minutes of mixing to gain benefit of the expansion system and allow to cure for a minimum of 24 hours, without physical disturbance. When cured the open end of the gas vent network can be directed to a well-ventilated location. It is not recommended that the feeder wire be run within the vent tubing of the Ebonex anode.

Connect strings of Ebonex discrete anodes together as recommended by the CP design engineer using non-coated titanium feeder wire. All wire jointing requires the use of titanium metal crimps, secured using the appropriate Fosroc crimping tool. After connections have been made continuity should be tested with a resistance meter. Any found to have a resistance >1 Ohm requires re-crimping. When the integrity of the connection is established the tail of each Ebonex discrete anode can be gently bent, thus settling the wire into the chased groove.

The chase is filled with a pre-bagged repair mortar or Ebofix grout and left for at least 4 days before connecting to the power system.

## Limitations

In chloride contaminated structures, particular attention should be paid to the control of driving voltage of systems, which should not result in potentials greater than 7V being applied to the titanium connecting wires. For further information consult your local Parchem office.

Performance of the Ebonex discrete anode is dependent upon the correct design, installation and maintenance of the Cathodic Protection system.

# Ebonex

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## Estimating

### Supply

Ebonex discrete anode: Ebonex discrete anode with 500 mm tail wire (see sizing for Ebonex discrete anode diameter and length)

Ebofix grout: Supplied in 10 kg bags

Wire pack: Titanium feeder wire

40 m x 1.5 mm diameter

Crimping pack: 80 titanium crimps

Venting pack: 20 m PVC venting tube plus 40 connecting T-pieces

Fosroc crimping tool: Crimping tool plus plattens

### Sizing

Type	Diameter x length (mm)	Current rating (mA)
CP07/100	7 x 100	2.0
CP10/100	10 x 100	2.8
CP10/150	10 x 150	4.2
CP18/100	18 x 100	5.1
CP18/200	18 x 200	10.2
CP18/300	18 x 300	15.2
CP28/100	28 x 100	7.9
CP28/300	28 x 300	23.7
CP28/600	28 x 600	47.5

## Storage

Store both the Ebonex discrete anodes and Ebofix grout in dry conditions in their original unopened packaging.

Ebofix grout has a shelf life of 12 months.

### Important notice

A Safety Data Sheet (SDS) and Technical Data Sheet (TDS) are available from the Parchem website or upon request from the nearest Parchem sales office. Read the SDS and TDS carefully prior to use as application or performance data may change from time to time. In emergency, contact any Poisons Information Centre (phone 13 11 26 within Australia) or a doctor for advice.

### Product disclaimer

This Technical Data Sheet (TDS) summarises our best knowledge of the product, including how to use and apply the product based on the information available at the time. You should read this TDS carefully and consider the information in the context of how the product will be used, including in conjunction with any other product and the type of surfaces to, and the manner in which, the product will be applied. Our responsibility for products sold is subject to our standard terms and conditions of sale. Parchem does not accept any liability either directly or indirectly for any losses suffered in connection with the use or application of the product whether or not in accordance with any advice, specification, recommendation or information given by it.

